

Building Encroachments

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Property law usually addresses encroachments with ejectment. Building encroachments differ, however, as restoring a landowner's property claims implies the reversal of often large costs sustained by the builder. The authority thus confronts the following dilemma: either it stands by the landowner, thereby facing the social costs of undoing significant investments and possibly supporting an opportunistic landowner that tries to hold up the builder, or it defends the investment of the builder thereby endorsing a kind of private eminent domain. In addressing building encroachments, national property laws have deployed different remedies ranging from a property rule in favor of the landowner to a property rule in favor of the builder with a variety of liability rules, often hybridized with property rules, in between. This paper models the builder-owner conflict after the theory of optional law (Ayres, 2005); it frames different national solutions into a common analytical setting; and it evaluates the different laws in their relative allocative and distributive outcomes and their capacity to constrain opportunistic behavior.

1. INTRODUCTION

A building encroachment happens when somebody erects a structure in whole or in part on another's property. Building encroachments are for instance very common in areas where floods or wildfires have previously cleared large portions of land and destroyed buildings and other landmarks that set the boundaries of property.

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All modern property laws address conflicts regarding the attribution and enforcement of property entitlements systematically favoring the owner¹ and generally reacting to violations by means of strong remedies in the form of property rules (Smith, 2004). However, when someone by mistake builds a construction partly on an adjoining plot of land, things get interestingly more complicated. Certainly, if the landowner does not enforce her property right, the builder may seek after a certain amount of years to become owner by adverse possession. If, however, the legal conflict between the builder and the landowner arises before adverse possession becomes applicable, then the law offers legal means other than ejection to both builder and landowner to resolve their conflict. Most civil codes have specific provisions that address cases of building encroachments, provisions that are sometimes referred to as the doctrine of *inverted accession*.² And the subject has been debated in common law courts also.³

This paper frames building encroachments into an economic model of legal remedies that is based on *optional law* (Ayres, 2005). The optional approach offers a taxonomy of rules that allows us to organize a subject which otherwise looks puzzling and also offers normative criteria to judge which laws are more efficient. However, as we will see, the optional approach does not wholly explain the provisions addressing building encroachments. We will observe how these laws are constructed in more complex ways than anticipated by the model in order to deal with the potential shortcomings of the Ayresian optional rules. The paper builds on the theory of optional law to clarify an area of property law and derives from these empirical observations some considerations upon the validity and the limits of the theory deployed. Therefore on one hand the paper offers support to Ayres' (1998) claim about the existence of remedies modeled after *put-options* in the law of property; a claim that has been questioned by leading property scholars such as Rose (1997), Epstein (1998) and Smith (2004). On the other hand it qualifies the presence of these put-option rules and shows that the arguments of the *put-rules* skeptics are nevertheless grounded: put-option rules in property do exist and

¹ The stability and reliability of owners' claims over their estates is considered to be – from Bentham (1789) on – the backbone of the modern liberal statehood that promotes development by letting people appropriate the fruits of their works and investments (Rose, 2000). Non-consensual appropriation thus is severely deterred by means of strong remedies: for instance trespass allows for damages and injunctive relief; theft is also a crime; and encroachments are mendable with ejection.

² According to Black's Law Dictionary (2005), *accession* is a "property owner's right to all that is added to the property (especially land) naturally or by labor, including land left by floods and improvements made by others." Conversely, under the doctrine of inverted accession (*accessione invertita* in Italy, *acción invertida* in Spain) the owner of the building *acquires* the landowner's title to the land and not the other way around.

³ See cases cited in footnote 22 and following notes.

at the same time the law carefully defines their applicability in order to address their potential drawbacks.

The same search for put-options in property law has been conducted before also in Nicita et al. (2006) with reference to several aspects of Italian property law. Compared with this previous work the present paper focuses simply on building encroachments and frames them into a comparative institutional analysis by looking at other legislations as well. Furthermore, the doctrine of adverse possession is a somewhat contiguous topic in the literature of law and economics (see Netter et al., 1986; Netter, 1998; Ellickson, 1986; Merrill, 1985; and Miceli & Sirmans, 1995) and we disentangle the differences between the two areas of the law in Section 4.4. To our knowledge there seems to be no previous economic analysis of provisions specifically addressing building encroachments. This is somewhat puzzling as, in addressing some shortcomings and rough edges of adverse possession, scholars have advanced proposals⁴ that closely resemble the rules analyzed in this paper, overlooking the fact that similar provisions already exist in the law.

The paper is organized as follows: in the next section we sketch a taxonomy of simple optional rules that may resolve the potential conflict between builder and owner and we construct archetypal remedies available to our hypothetical authority. The menu of rules is the one devised by Calabresi & Melamed (1972) and enriched by Ayres & Goldbart (2001). We then formulate a normative criterion that allows us to rank the rules in terms of allocative efficiency, distributive justice and the capacity to constrain parties' opportunism.

Thereafter we look at how building encroachments are actually regulated in several relevant legislations. We will show that actual provisions are more complicated than the simple optional rules of the Ayresian model and generally envisage the possibility of switching between property rules and liability rules. This switch, as we will argue, constitutes a filtering mechanism against the potential opportunistic use of liability rules. We then pigeonhole the laws into our schedule of theoretical rules and judge them in accordance with our normative criteria.

2. MODELING THE CONFLICT BETWEEN THE BUILDER AND THE LANDOWNER

Normally, a builder in need of a portion of land would negotiate a transaction directly with the landowner. We assume that, absent significant transaction costs, a deal should be reached whenever $v_B > v_L$ where v_B is the value to the

⁴ For instance Merrill (1985) suggests the application of a liability Rule II instead of a property Rule III in case of bad faith adverse possession and Kim (2003) suggests making the grant of adverse possession dependent upon a standard of monitoring effort to be fulfilled by the landowner.

builder and may be based on her expectations of the returns on her investment and v_L is the valuation of the landowner and may be based on the productivity of the land as an agricultural input, its rental value or some idiosyncratic valuation that landowners attach to their properties (for instance because of the endowment effect (Jacques, 1992)). Of course, where precisely the bargain settles between v_B and v_L depends on the relative bargaining skills and bargaining power of the two parties. We assume that each party to the conflict knows her own valuation of the area of land and that due to reciprocal asymmetric information each of them only knows the distribution of the other's valuation $f_B(v)$ and $f_L(v)$ with mean value μ_B and μ_L and variance σ_B and σ_L respectively.

The relationship between land neighbors is typically a low transaction costs setting, and absent other peculiar conditions, we shall assume that this is typically a situation where transactions based on voluntary exchange should work well and should thus be encouraged by the law. Nevertheless, in some concrete situations, ascertaining the scope of property rights often entails significant costs (Sterk, 2008) and thus it may happen that the builder constructs without the landowner's consent. This may occur due to incorrect surveys, guesses or miscalculations by the builder and/or the landowner and, as with the case of floods and wildfires, these errors are quite common and understandable.

2.1. BILATERAL MONOPOLY AND PARTIES' OPPORTUNISTIC BEHAVIOR

When such a building encroachment happens, things change, and to capture the essential features of this conflict we model it as a bilateral monopoly with asymmetric information. It is a bilateral monopoly because once the building is in place the two parties are co-specific. On one hand it is not worth it for the builder to negotiate with other landowners the acquisition of other plots of land (for the purpose of constructing this precise encroaching building), and on the other hand the landowner cannot make any alternative use of her land (including sale) during the encroachment. The conflict arises over the attribution of the area occupied by the building⁵ and the parties go to court to seek enforcement of their respective claims over the rival entitlement. The landowner claims title to the land. The builder wants the landowner's claims to

⁵ As we shall see later on when we review the actual laws (Sections 4.1 and following) the "attribution of the area of land" occupied by the building can be declined in different ways. This attribution in fact could imply the transfer of ownership, a lease, or an easement. In economic terms the three arrangements are substantially the same on the assumption that i) the area of land is the same, ii) the construction is there to stay in the long run and iii) the present value of the land reflects the expected future stream of payments (generated by its rent or in exchange for the easement) subject to a reasonable discount rate.

be dismissed or at least she wants to agree a compromise solution in order not to forfeit her investments in the building.

The possibility of litigating the entitlement offers the chance to behave opportunistically. The first type of opportunism⁶ that may arise stems from the builder's incentive to misrepresent the circumstances of her encroachment. Remember that, by default, a potential builder should negotiate a voluntary transaction with the landowner. Suppose for instance that the builder has a high v_B but she is faced with a landowner with an even higher v_L . In this case, in theory no transaction should take place. Instead, by pretending an erroneous encroachment, the builder is able to circumvent the landowner's will and this may create some potential gains from opportunism depending on the remedy implemented.

The landowner may potentially indulge in opportunistic behavior also. In fact, note that the impairment suffered by the landowner is immediate and provokes a discontinuity in her valuation of the occupied land; however, the value of that land to the builder grows monotonically with time as her investments in the building become irreversible. If the landowner immediately reclaims her land, the builder might easily demolish the construction and relocate it or easily bargain with other neighbors. In these circumstances the builder's specificity to the landowner's land is very low. However, the more she builds on the encroached land, the higher the value of the unlawfully occupied land becomes to her, and the more expensive the outside option of building somewhere else becomes. Specificity increases and this confers bargaining power upon the landowner. Depending on the remedy implemented, the landowner might be able to extract possibly almost all of the (now increased) v_B , from a piece of land that, in the limit case, neither she nor the builder had valued as highly before.

The two opportunisms are mutually exclusive since when the builder deceitfully encroaches, she does so discounting all the possible remedies available to the landowner and regardless of whether the landowner acknowledges the encroachment early or later on. Conversely, the landowner's wait for the builder's outside option to grow can be considered opportunistic only as long as the builder is unintentionally encroaching, otherwise we are in the previous case.

⁶ Although the term "opportunism" is predominantly used in the context of contracts, we here face the same risk of parties engaging in a close relationship and "seeking-self interest with guile" "through a lack of candor or honesty in transactions" (Williamson, 1973). Williamson distinguishes between an *ex-ante* opportunism consisting in the strategic misrepresentation of asymmetric information and an *ex-post* opportunism that boils down to the hold-up problem. Similarly we point to the builder's *ex-ante* incentive to encroach instead of transact, and to the landowner's *ex-post* incentive to hold up the builder.

2.2. THE ENFORCEMENT AUTHORITY

Information asymmetry exists also between the parties and the enforcement authority:⁷ the latter does not know v_B and v_L but only the means of the respective distributions μ_B and μ_L . The enforcement authority decides both the allocation of the entitlement between the two parties, and which remedy to deploy to enforce its decision.

What are the goals of the authority? The authority has various, often conflicting, goals. Among them are *distributive justice*, *allocative efficiency* and *deterrence*. By deciding upon the allocation of an entitlement, the authority affects (i) the distribution of wealth and rights between the parties; (ii) the chances that this wealth is socially maximized, and (iii) the *ex-ante* incentives for parties to abide by the law.

In the remainder of the paper we assess the implications of the choices available to the authority – the choice of remedies – in terms of these three goals. With regard to the first goal, equity and other justice concerns always have been considered the primary role of the authority (Calabresi & Melamed, 1972) and therefore the court's decisions over the allocation of the entitlement between the parties may be subordinated to its preferences over the distributive outcome. In terms of allocative efficiency, the court is interested in allocating the entitlement in such a way as to make it end up in the hands of whoever values it the most. This is the classical implication in law and economics of the Coase conjecture (see Medema & Zerbe, 2000). And finally, as a matter of deterrence, the authority is interested in deploying and applying remedies that align *ex-ante* parties' incentives with the dictates of the law.⁸ In particular, the law might seek to have actual building encroachments addressed without inducing potential builders to encroach opportunistically and without inducing landowners to wait too long before seeking to address the encroachment.

Most of the remedies that we will consider below envisage a precise measure of damages. Although damages may be computed in many ways, we focus on a measure of damages that is aimed at compensating one party for the loss suffered. Given that the authority does not usually know the parties' exact valuations of the entitlement, it sets $D = \mu_B$ if the landowner pays damages to

⁷ We refer to the generic enforcement authority as the institution that clears the conflict over the entitlement. While it is easy to identify this authority with the court in common law systems, for civil law it is better thought of as the combination of the statutes regulating building encroachments and the judges that apply them. In the remainder of the paper we will use the words "authority" and "court" interchangeably.

⁸ This notion of deterrence is in line with Posner's (1985) and distinguished from Becker's (1968). On the distinction between Posnerian absolute deterrence and Beckerian optimal deterrence, see Hylton (2005).

the builder, and $D = \mu_L$ if it is the other way around. In this way, the party that is paid damages is on balance compensated. This way of computing damages is both positively descriptive – as the authority offers the victim the best possible compensation for the loss suffered – and normatively efficient as this amount maximizes social welfare.⁹ However, we will see that, as a matter of deterrence, these damages do not necessarily deter all opportunistic behavior.

2.3. A SIMPLE TAXONOMY OF OPTIONAL RULES ADDRESSING BUILDING ENCROACHMENTS

In the original Calabresi & Melamed framework, remedies were grouped into property rules and liability rules. In the realm of property law, a property rule type of remedy confers upon the entitled party a strong protection forbidding any interference with the owner's rights by other parties. A liability rule instead allows the counterpart to access the entitlement upon payment of damages. The optional characterization¹⁰ of the Calabresi & Melamed framework reinterprets liability rules as *call-options*: to say that the court determines that the builder can access the landowner's property upon the payment of damages is equivalent to saying that the builder is given a call-option over the landowner's entitlement that can be exercised at the strike price of damages. The next step is to imagine put-option like liability rules, which are remedies that confer upon one party both the holding of the entitlement and the power of forcing the counterpart to buy it at the strike price of damages. In Ayres & Goldbart's (2001) jargon, whoever holds the option is the *chooser* (as she chooses the final allocation by deciding whether to exercise the option) and the counterpart is the *non-chooser*.

Hereinafter we characterize the different rules that can be deployed by the authority in allocating the entitlement between the builder and the landowner using the Calabresi & Melamed (1972) categorization.

⁹ See Kaplow & Shavell (1996). To see why this is so, suppose that the court opts for a Rule II (see later in the text) and sets $D = \mu_L$. The builder therefore takes the land only when her valuation is higher than the average valuation of the landowner. Suppose instead that $D < \mu_L$, then transfers happen at values below the landowner's average valuation, meaning that in some cases the entitlement would be moved from the party that values it more (the landowner) to the lower valuing party (the builder). Conversely, with $D > \mu_L$ the landowner retains the entitlement even in certain cases where her valuation is lower than the builder's. Therefore damages set at $D = \mu_L$ maximize the number of Pareto-improving transactions and thus social welfare.

¹⁰ The literature on remedies following the work of Calabresi & Melamed (1972) has gone through a major paradigmatic breakthrough, from the mid '90s on, thanks to the adoption of the optional analysis borrowed from the analysis of financial derivatives. In this literature we should mention in particular Krier & Schwab (1995) Kaplow & Shavell (1995, 1996), Ayres & Talley (1995b; 1995a), Ayres & Balkin (1996), Ayres & Goldbart (2001), and Ayres (2005).

Rule I: *The authority orders the builder to return the land to the landowner.*

This is a standard property rule. The authority acknowledges that the landowner is entitled to the land and orders the builder to remove the construction and (maybe) to pay a sanction for encroachment (and/or for not respecting the court's injunction not to trespass). Under Rule I, total payoffs are given by the valuation of the entitlement by the builder that is equal on average to μ_L .

Rule I, the property rule in favor of the owner, is usually the default rule when the authority wants to channel the transaction through the market. By protecting the entitlement with Rule I, it is made clear to the builder that she must gain the landowner's consent in order to acquire the entitlement or otherwise be bound to reconstitute the land. Rule I thus achieves full deterrence of builders' opportunistic ambitions but leaves those of landowners untouched. Under Rule I the landowner can wait until the builder becomes very specific and then she can seek the redress of the encroachment. In this case the landowner has a strong hold over the builder in the bargaining.

Rule II. *The authority orders the builder to choose between a) restituting the land or b) keeping the land and paying damages*

This is the optional characterization of the traditional liability rule. The authority recognizes the owner's entitlement to the land; however, it does not order the builder to dismantle the building but allows her to maintain it upon payment of damages. In other words, the court confers a call-option upon the builder, an option that she can exercise over the owner's entitlement at the strike price equal to the damage amount. If the builder's private valuation is higher than the damage amount, she will choose (b) exercising the call option, allocating the land to herself, paying damages, and still gaining the difference $v_B - D$. Given the

distribution $f_B(v_B)$, the option value for the builder is $\int_D^{\infty} (v_B - D)f_B(v_B)dv_B$.

We have previously argued (see Section 2.2) that optimal damages should be set equal to the mean valuation of the non-choosing party. In this case the non-chooser is the landowner and her mean valuation is μ_L , and therefore the

value of the option under a Rule II is $\int_{\mu_L}^{\infty} (v_B - \mu_L)f_B(v_B)dv_B$.

If the builder's valuation is below the damage amount she will opt for (a), thus returning the land. In this case the landowner regains an entitlement that she values on average μ_L . If the builder opts for (b) the landowner is

compensated exactly with μ_L . Then total payoffs under a liability Rule II are

$$E(\pi \text{ rule II}) = \mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B.$$

In terms of deterring opportunism, Rule II encourages the opportunistic behavior of builders vis-à-vis landowners with a high valuation ($v_L > \mu_L$) who are now forced to sell the land at μ_L . At the same time a landowner with a low v_L can wait and see the builder's v_B increase up to the point where $v_B > \mu_L$; when this happens the landowner is able to extract μ_L in the form of damages from the builder.

Rule III: *The authority allows the builder to maintain the land and orders the landowner to renounce her claims.*

This rule is the reverse of Rule I. The court transfers the ownership of the land to the builder.

Under Rule III, total payoffs are $E(\pi \text{ Rule III}) = \mu_B$.

Under this rule, the incentives to behave opportunistically for the builder are strong since instead of negotiating a transfer, she can basically force the transfer for free. Conversely the landowner cannot possibly exploit the rule in any way to her advantage.

Rule IV: *The authority orders the landowner to decide between a) giving up her claims or b) paying the builder to have the land returned.*

Optimal damages are set equal to μ_B . If the landowner values the entitlement at less than μ_B then she opts for (a) and the builder retains an entitlement worth to her on average μ_B . If the landowner opts for (b) she gains on

average $\int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$.

Total payoffs are thus: $E(\pi \text{ rule IV}) = \mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$.

Also Rule IV allows a potential opportunistic builder to extract a rent from a landowner in the form of a damage amount or the land itself whereas it neutralizes the landowner's advantage of waiting to try to hold up the builder.

Rule V: *The authority orders the landowner to comply with the builder's decision to either a) keep the land (in which case the landowner must renounce her claims) or b) resituate the land (in which case the landowner must pay damages)*

The court confers upon the builder both the entitlement and the put-option that can be exercised at the strike price of the mean landowner's valuation μ_L .

If $v_B > \mu_L$ then the builder opts for (a) and keeps the entitlement, otherwise she opts for (b), sells the entitlement and collects μ_L . Total expected payoffs for

$$\text{Rule V are } E(\pi \text{ rule V}) = \mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B.$$

Rule V (indeed the most favorable to the builder) induces the builder's opportunism since she obtains either the land or the payment of damages.

Rule VI: *The authority orders the builder to comply with the landowner's decision to either a) have the land restituted (in which case the builder must renounce her claims) or b) keep the land (in which case the builder must pay damages)*

The court gives the entitlement to the landowner as well as a put-option to force the builder to buy the land at the strike price of her mean valuation μ_L . The landowner keeps the entitlement if $v_L > \mu_B$, otherwise she sells the entitlement and collects μ_B . Total expected payoffs for Rule VI are:

$$E(\pi \text{ rule VI}) = \mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L.$$

Under Rule VI the opportunism of the builder is controlled because if she faces a landowner with low v_L , she must now pay damages instead of a low price and if she faces a high value landowner, the latter will demand either a high price or the restitution of the land. Conversely the landowner with a low valuation still has the incentive to wait and hold up the builder.

Rule VII: *The authority orders the builder to 1) pay initial lump-sum damages and then 2) decide whether to a) return the land or b) keep the land and pay additional compensatory damages.*

Under Rule VII the authority gives the entitlement to the landowner and the call-option to the builder, and obliges the builder to transfer an amount T of money to the landowner before her final allocative decision. Then, if $v_B < \mu_L$, she opts for a) and returns the land to the landowner. If $v_B > \mu_L$ the builder keeps the

$$\text{land, transfers } \mu_L \text{ to the landowner and gains } \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B.$$

The landowner in case (a) gets T and the entitlement of average value μ_L and in case (b) she gets the transfer T plus transfer μ_L .

The initial lump-sum transfer from the builder to the landowner does not necessarily nullify the expected payoffs¹¹ for the builder but it is at least more generous to the landowner in comparison with a simple Rule II without affecting the builder's allocative incentives.

Rule VII has some interesting characteristics: the builder pays something to the landowner regardless of her decision. The rule biases the distribution further in favor of the landowner in such a way as to compensate her fully for the loss of control over the entitlement. In a sense it reaches a distributive outcome that is the opposite of the put implementation of Rule V where the builder has both the entitlement and the option. Nevertheless the incentives for the builder to take or not to take up the option are the same since the builder only takes it up whenever her valuation is greater than the average valuation of the landowner. As for Rule II and Rule V, total payoffs are

$$E(\pi \text{ rule VII}) = \mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B,$$
 although they are redistributed differently between the builder and the landowner.

Rule VII neutralizes the opportunism of the builder if the initial lump-sum transfer is set at such a level that it offsets all the potential gains that the builder could extract from the avoidance of the voluntary transaction with the landowner. The landowner with a low valuation still retains the incentive to wait, but her opportunism is mitigated by the fact that, at most, she will receive μ_L .

Rule VIII. *The authority orders the builder to 1) pay initial lump-sum damages and 2) comply with the landowner's decision to a) have the land restituted (in which case the builder must renounce her claims) or b) keep the land (in which case the builder must pay additional compensatory damages)*

¹¹ In the original formulation of the *pay or pay* rule in Ayres & Goldbart (2001) initial damages T are set equal to the value of the option to be exercised by the builder. When the builder opts for (b), the landowner gets $\mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$ while if she opts for (a) the landowner keeps something she values on average at μ_L plus the initial transfer. In either case the landowner appropriates all payoffs of the transaction. It should be noted that the task the authority is asked to accomplish – tailoring the amount of damages to the value of the call for the builder – is cumbersome: if the court can really compute the value of the option, it means that it knows the private valuation of the builder and thus the information-harvesting effect of liability rules (see Kaplow & Shavell, 1996) is forgone since the allocative choice of the chooser reveals a piece of information the court already knows. In fact, if the authority knows the private valuations of the parties, it can directly allocate the entitlement to the one who values it the more.

Rule VIII has both the put-option and all of the payoffs assigned to the landowner, and thus it is very favorable to her.

To begin with, the builder must transfer T regardless of whether she will eventually maintain the entitlement. If $v_L > \mu_B$ then the landowner will have the entitlement back (a) otherwise the builder will have to further transfer μ_B to the counterpart (b). In fact the builder is likely left with a negative payoff (unless $v_B \geq \mu_B + T$).

The landowner thus obtains $\mu_B + T + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$ whereas the

builder's payoffs are $-T$.

Rule VIII implies negative payoffs for the builder and thus neutralizes any builder's ambition to litigate opportunistically. Conversely it confers a strong hold to the landowner, who can force the builder to pay her a transfer and still retain full control of the final allocation of the land.

TABLE 1					
Rule	Damages amount and allocation		Builder's payoff	Landowner's payoff	Total payoffs
	B	L			
I	-	-	0	μ_L	μ_L
II	μ_L		$\int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$	μ_L	$\mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$
III	-	-	μ_B	0	μ_B
IV		μ_B	μ_B	$\int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$	$\mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$
V		μ_L	$\mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$	0	$\mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$
VI	μ_B		0	$\mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$	$\mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$
VII	$T + \mu_L$		$\int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B - T$	$T + \mu_L$	$\mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$
VIII	$T + \mu_B$		$-T$	$T + \mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$	$\mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$

In the second and third columns we show which party ought to pay damages and transfers according to each rule. In the last three columns, we show how total payoffs are distributed between the two parties.

These eight theoretical rules¹² will be used later on to analyze the way different national laws address building encroachments.

Note from Table 1 that total payoffs under Rules II, V and VII – where the *builder is the chooser* – are the same. So it is for Rules IV, VI and VIII – where the *landowner is the chooser* – although the payoffs are distributed differently under either put or call implementations of the two groups of rules.

On the allocative side, this means that there are different levels of social welfare that can be achieved by choosing to implement either i) a *builder-as-the-chooser* rule, or ii) a *landowner-as-the-chooser* rule, or iii) a property Rule I, or iv) a property Rule III.

On the distributive side, this implies that the same level of social welfare can be achieved under strikingly different distributive outcomes; and this can be done by choosing remedies in the form of either put, or call, or other more complex rules (such as Rule VII and Rule VIII described above) within the same family of rules (*builder-as-the-chooser* rules or *landowner-as-the-chooser* rules).

Parties' opportunism also goes along with distribution. Normally the parties would transact the land through the market and therefore whether the land changes hand, and at what price, depends on the free and willful bargaining of the two parties. Conversely if instead they litigate it, the allocation and distribution depends on the remedy implemented by the authority. The intuition is that the more the bias in the distribution favors one of the two parties, the larger is her incentive to indulge in opportunistic behavior. More precisely, in the case of builders that consciously encroach, the more favorable the difference between her own v_B and the expected payoff under any particular rule, the larger is the incentive to abandon negotiation and to seek a remedial solution.

As said, the incentive to behave opportunistically exists also for those landowners who can wait intentionally before seeking restitution. To begin with, a landowner with a low valuation of the land (who therefore is potentially willing to sell) may be inclined to wait for the builder's specificity to grow along with v_B in order to be able to extract as much as possible (and possibly close to the maximal v_B) through a voluntary transaction. But even if the dispute is litigated, the landowner might be able to extract a profit under some of the remedies as long as there is a positive difference between whatever she gets under any particular remedy and her own v_L .

¹² It should be noted that the theory of optional law developed by Ayres and his co-authors allows the construction of rules that achieve each possible division of total payoffs between the parties with both put and call implementations for the two allocative outcomes that can be reached under any *builder-as-the-chooser* rule or *landowner-as-the-chooser* rule. This is the "convexity" result of Ayres & Goldbart (2001). The authors demonstrate the theoretical existence of a double continuum (one for call and one for put implementation) of rules, which – without affecting the allocative decision of the chooser – distributes smoothly the expected joint payoffs between the parties.

2.4. WHICH RULE PERFORMS BEST? ALLOCATION, DISTRIBUTION AND OPPORTUNISM CONSTRAINT

We have so far presented a taxonomy of legal remedies; we have deconstructed the rules and made them assessable in terms of i) allocative efficiency, ii) distributional outcomes and iii) intensity of the incentives to behave opportunistically.

However, in order to set the rules against each other and rank them according to some criteria, we have to go one step further. The analysis developed by Ayres & Goldbart (2001) not only offers a rich menu of liability rules that the authority can pick from, but also proposes a normative criterion to choose the rule that best maximizes efficiency. The recipe of optional law is that, in order to maximize social welfare, i) optimal damages should be set equal to the entitlement's value to the non-choosing party, and ii) the decision to choose (and therefore the put or call-option) should go to the party that has the more speculative valuation of the entitlement (see Appendix 1 for the derivation of the results).

Who, between the builder and the landowner, is the more efficient chooser? If the answer to this question must be given case by case, then optional law becomes burdensome to courts. In fact we can easily notice that all rules stylized above are potentially efficient depending on certain assumptions¹³ and therefore judges must gain knowledge of the parties' private valuations. Therefore the relevant question becomes: is there any specific characteristic of the cases of building encroachments that can lead us to consider the builder regularly as a better chooser than the landowner (or vice versa) and therefore lead us to consistently choose one rule over another on allocative grounds?

We claim that *builders have more speculative valuations than landowners*. It seems reasonable to argue that the builder has a more speculative valuation of the entitlement, that is to say that the distribution of the builder's valuation has a higher variance than that of the landowner ($\sigma_B > \sigma_L$). This is because the builder's expectations of future returns are based on a risky investment while the landowner usually has a past consistent stream of income to measure with. More importantly, one may argue that the construction business is usually more speculative and uncertain than businesses linked with the use of land, especially if used for agricultural purposes.¹⁴

¹³ At a first glance, one might think that property rules are always less efficient than liability rules because they lack any option and the relative value to its holder. However in the limit case for which the variance of the distribution is zero, the value of the option is also zero and the property rule is as efficient as the liability rule.

¹⁴ An alternative normative ranking criterion could (someone may argue) be derived from the observation that *landowners have higher valuations of their lands*. Landowners, after all (so the argument may proceed) are the ones that have the greatest valuation of their land, not least

For the sake of simplifying the analysis that follows, we also assume that both parties have the same mean valuation of the entitlement ($\mu_L = \mu_B$, see also footnote 14) and that the transfers of Rule VII and VIII are set roughly equal to the *value of the chooser's option*.¹⁵

Allocative ranking. If the builder is the party that has the more speculative valuation of the entitlement, than she is the one that, on average, triggers the generation of higher joint payoffs and, therefore, the authority should pick a rule that delegates her the decision over the final allocation: namely either a Rule II, a Rule V or a Rule VII. Rules that have the landowner-as-the-chooser (IV, VI and VIII) generate inferior aggregate payoffs and the two property rules (I, III) still lower ones. Optional law offers us guidance on how to pick the correct rules in terms of efficient allocation and leaves us choice in terms of which rule achieves an unspecified distributive goal.

because if it were otherwise they would have transacted it away. Strong defense of land property is often based on the presumed superior capacity of owners to evaluate the risks of their investments in land (Smith, 2004) and also to the idiosyncratic value they attach to their property. In more formal terms this alternative hypothesis implies that $\mu_L > \mu_B$, that is to say that at least on average, landowners have a higher valuation of the land than builders do. We also hypothesize $\sigma_B = \sigma_L$ not least because otherwise it would not be alternative to our other main criterion. What does this mean in terms of our ranking of rules?

We have seen how the relative efficiency of putting the option in the hands of the builder or the landowner does not depend upon the means of the two distributions. And given the fact that the variance is the same, then also the value of the options, regardless of their peculiar implementations, is the same. Therefore we cannot assess which rule is best as all rules look equally efficient (although their distributional outcomes are obviously different). There is one limit case: assuming that the valuation of parties are precisely known (so $v_L = \mu_L$ and $v_B = \mu_B$ and also $\mu_L > \mu_B$) then a property Rule I that leaves the property in the hand of the landowner is what is needed to achieve first best allocations – on the assumption that there is no bargaining in the shadow of the law, otherwise even Rule III is equally efficient. Indeed, even under any other liability rule with damages set at the non-chooser mean value, the allocation would be exactly the same (in fact if there is no variance in the valuation, the option is not valuable any longer); thus property rules may be preferable because of lower administrative costs (Calabresi & Melamed, 1972; Smith, 2004). However, it seems quite implausible that the court has perfect knowledge of private valuations and that the private valuations of landowners always exceed those of builders. To conclude, we cannot derive a ranking criterion from the hypothesis that *landowners' valuations exceed on average builders' ones* (with equal variance). We have seen that this hypothesis does not offer guidance in identifying efficient rules as all rules are equally efficient except for cases where a landowner's valuation is known with certainty by the court to exceed the builder's (a fairly constraining assumption); a case for which a Rule I achieves first best allocation.

¹⁵ So either $\int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$ for Rule VII or $\int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$ for Rule VIII

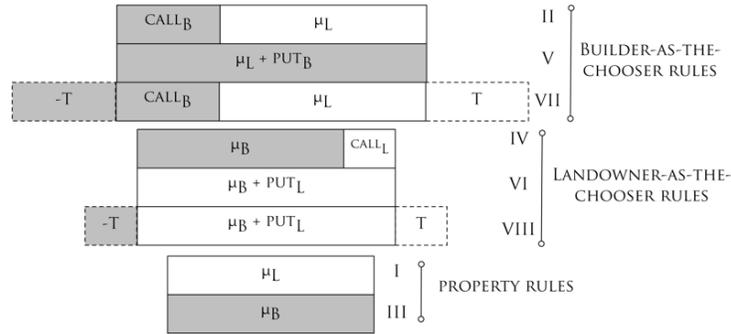
(see also footnote 11). Again this assumption is made for the sake of simplicity and other T s simply imply different, but easily computable rankings for Rules VIII and VII.

Distributive ranking (favoring the landowner). Which one of the three efficient rules mentioned above should be picked depends on the distributive concerns of the authority. *Prima facie*, there seems to be a strong argument in favor of defending the *status quo* and thus taking the side of the landowner. Remember that without the erroneous encroachment, the builder should have negotiated the transaction with the landowner and the latter would have presumably conceded it only to her own advantage. With the encroachment, however, the landowner suffers an impairment and may be forced to give up the land non-consensually without having played any active role on her side to make the encroachment arise (we here rule out for a moment the possibility of her opportunism). There are a number of distributive justice arguments that can support the claims of the landowner. For instance a libertarian argument can be made insofar as the landowner has acquired the land in accordance with the principle of justice in acquisition or in transfer and she is therefore entitled to it (Nozick, 1974). As a consequence, a Nozickian judge should not let her be made worse off by the encroachment. The interests of the landowner should be supported also under a desert-based principle (Dick, 1975; Lamont, 1997) insofar as the landowner does not take any action that makes her *deserving* of the encroachment and/or – on the contrary – she has undertaken actions that make her deserving of the full entitlement to the land.

Therefore, if the authority intends to leave the landowner no worse off because of a builder's encroachment, it should pick a rule with a distribution skewed towards the landowner.¹⁶ The one most favorable to the landowner is Rule VIII, which confers upon her the put-option as well as the lump-sum transfer in addition to compensatory damages. At the bottom end of the scale there is Rule V, which deprives the landowner of the entitlement to the land and subdues her to the builder's allocative will. Table 1 illustrates the precise ranking of the rules; a ranking that is also summarized in the second column of Figure 2.

¹⁶ Of course the arguments in favor of the landowner are not so clear-cut under other approaches. For instance i) a strictly egalitarian principle, ii) a Rawlsian (1971) argument or even iii) a resource-based principle (Dworkin, 1981; Sen, 1993) could justify the implementation of rules favoring – for instance – the builder based on arguments that the builder is respectively i) less wealthy ii) the least advantaged party and iii) the party that, at some reference point, was less endowed or capable.

Figure 1



The figure graphically represents the implications of our normative claim about what characterizes building encroachments. If the builder is the more efficient chooser ($\sigma_B > \sigma_L$), and assuming that the builder and the landowner have the same mean valuation ($\mu_L = \mu_B$), that $T = \text{value of the chooser's option}$ and that damages are set equal to the non-chooser's mean valuation, then we see how builder-as-the-chooser rules generate greater aggregate payoffs (represented by the horizontal length of the bars) than landowner-as-the-chooser and *property rules* respectively. At the same time each rule presents a different distribution of payoffs between the two parties. The builder's slice of the total payoffs of each rule is grayed and the landowner's is in white.

Figure 2

ALLOCATIVE RANKING	DISTRIBUTION (FAVORING THE LANDOWNER)	CONSTRAINING LANDOWNER'S OPPORTUNISM	CONSTRAINING BUILDER'S OPPORTUNISM
II, V, VII	VIII	III, V	VIII
IV, VI, VIII	VII	IV	VII, VI, I
I, III	VI	I, II	II
	I, II	VI	III, IV
	IV	VII	V
	III, V	VIII	

In the first column the rules are ranked according to which one generates more aggregate payoffs. In the second column rules are ranked according to how favorable they are to the landowner. In the third and fourth column they are ranked in order of how far they are capable of constraining the builder's (third column) and the landowner's (fourth column) opportunism. The white rules (in the last two columns) are those that neutralize parties' incentives to behave opportunistically. The gray ones are those that encourage them. All four rankings are made under the assumption that the builder is the more efficient chooser ($\sigma_B > \sigma_L$), that the builder and the landowner have the same mean valuation ($\mu_L = \mu_B$) and that $T = \text{value of the chooser's option}$.

Opportunism-constraint ranking. We have seen that parties may indulge in opportunistic behavior under different remedies depending on how much the payoffs gained under each remedy depart from the payoff likely to be obtained in a normal willful transaction. Each remedy has a different impact on the builder's and the landowner's incentive to behave opportunistically and this depends on how biased is the distribution towards the interests of the party that may indulge in the opportunistic behavior.

Consider now the capacity of each rule to constrain landowners' opportunism. Consider the case of a landowner with a low v_L who thus is potentially likely to be willing to trade the land away. Remember that under a voluntary transaction the landowner might face a builder with a low v_B and high outside options and therefore the landowner's potential gains from bargaining are very limited. However, if she waits before seeking to enforce a Rule I she faces a higher v_B and an increase in the builder's specificity and thus she is able to win a better bargain. If a Rule II is instead applied she can extract at most μ_L (since presumably the builder will choose to take the land and pay damages if $v_B > \mu_L$ or retribute if $v_B < \mu_L$). If a Rule VI is applied, the landowner can choose between obtaining damages μ_B (she will do so if faced with a builder with a low v_B) or seeking restitution in order to sell the land through a willful transaction (she will do so if faced with a builder with a high v_B). If a Rule VIII is applied, then she gets the lump-sum transfer plus the choices of Rule VI and so on. All landowners have an incentive to behave opportunistically under a Rule VIII while few have it under a Rule IV¹⁷ and none have it under a Rule III or V. Note that the ranking is the opposite of the distributive ranking in favor of the landowner which we have seen just above. This is not surprising, as we have said that the intensity of the incentive to behave opportunistically goes along with the bias in the distribution. Generally speaking we could say that Rules III and V prevent landowners' opportunism while all other rules encourage it to some extent.

Now consider the capacity of each rule to constrain builders' opportunism. By default the builder should negotiate the purchase of the land and, if matched with a particularly tough landowner, she might end up paying something close to v_B for the land. But, if protected with a Rule II, she could instead pay μ_L and under a Rule IV she could acquire the entitlement for free or even be paid μ_B and so on. It is easy to see that the rule most favorable to the builder¹⁸ (and thus

¹⁷ Under a Rule IV some landowners with a low v_L prefer to wait for the builder's valuation and specificity to grow and then pay damages to have the land back in the hope that the builder offers to transact at a price higher than μ_B .

¹⁸ The ranking of the rules more favorable to the landowner mirrors the one of the builder, as can be seen in Figure 2.

most likely to encourage opportunism) is Rule V, followed by Rules III, IV and then II. Under each one of these rules, at least some builders (those with private valuations higher than the remedial price) have the incentives to deceptively encroach. Rules I, VI and VII (if T is – as we have assumed – sufficiently high) neutralize the potential net benefits of transacting over litigating, and finally Rule VIII discourages opportunism even further by making the expected payoffs of litigating negative. The ranking in terms of rules' capacity to constrain builders' opportunism is as shown in Column 4 of Figure 2; roughly speaking we can argue that Rules VIII, VII, VI and I deter builders' opportunism while all other rules encourage it to some extent.

2.5. THE AUTHORITY'S DILEMMA

To sum up this first part of the paper we shall recall that our hypothetical authority strives to achieve three main goals in addressing building encroachments: distributive concerns, especially with regard to the blameless landowner; allocative efficiency; and deterrence of opportunistic behavior. In order to do so, the court can deploy a variety of remedies. We have stylized eight among them. The authority can reasonably argue that, on average, builders have more speculative valuations of the entitlement than do landowners. This point is central in our reasoning. If the authority believes this, if it computes damages upon the mean valuation of the *non-chooser* and sets potential transfers equal to the mean valuation of the *chooser* then it can safely rely on some of the following prescriptions: i) the court should choose between Rule II, V and VII because these are the ones that produce better allocations; ii) the authority should then opt for Rule VII because it is the rule that leaves the landowner no worse off; iii) Rule VII also has the advantage of constraining the builder's incentive to behave opportunistically; iv) however, the court must realize that under Rule VII the landowner retains an incentive to wait strategically in order to hold up the builder.

The authority's dilemma is that there does not exist a remedy to constrain both parties' incentive to behave opportunistically and any choice driven by other allocative and distributive considerations is likely, under this menu of rules, to bring this trade-off about.

3. BUILDING ENCROACHMENTS IN DIFFERENT NATIONAL LAWS

We now look at how different national legislations address cases of building encroachments. We refer specifically to some civil law legislations such as French, German, Norwegian, Swiss, Portuguese and Italian law and to the

United States law as well. In analyzing building encroachment laws we see a variety of rules across different countries that cover almost the entire spectrum of optional rules presented above.

In addressing building encroachments, remedies range from stringent protection of landowners' property rights to fictitious contracts such as easements or leases and the subsequent payment of permanent damages calculated with a great deal of creativity, to forced sale of the land. Although substantive property law is remarkably constant across different legal systems (Mattei, 2000), this is a corner where we see a peculiar variation. We here present a synthesis of the rules of some countries of both civil law and common law traditions. The codes upon which the synthetic rules are built are presented in Appendix 2.

French law. Rule I

There is no distinction between encroaching buildings emanating from a builder's property and those erected entirely on the landowner's property. Therefore the stringent property rule in favor of the landowner usually applies.¹⁹ The French law is a simple property Rule I. We have seen that it can be efficient only under the assumption that $\mu_L > \mu_B$ and that the valuations are precisely known by the court (see footnote 13). If this is the case, the court assigns the land directly to the most efficient user. Under less stringent assumptions, however, property rules are dominated in terms of efficiency by all other liability rules (Kaplow & Shavell, 1996; Ayres, 2005). In distributional terms, the rule obviously favors the landowner; however, both Rule VI and Rule VII would achieve higher welfare and a distribution more favorable to the landowner than Rule I itself. As noted before, Rule I encourages landowners' opportunism.

Italian law. *t₀) Rule I. If conditions [a) emanating building b) good faith c) 3 months elapsed] are all met then t₁) either Rule VII or VIII is applied. Damages: twice the market value; T: compensation for damages.*

The landowner can eject the builder within three months from the beginning of construction (Rule I). After this period, and under the presumption of good

¹⁹ The Spanish code is equally strong on the applicability of a straight property Rule I (see law included in Appendix 2). However, there seems to be a large gap between what the civil code says (it mandates the straight application of Rule I) and what judges actually do in courts where they usually apply Rule II if the following conditions are met: a) the majority of the building must be built on the builder's own property; b) the destruction of the part of the encroaching building is uneconomical; c) the value of the building must significantly exceed the value of the occupied land; d) the builder acted in good faith. (Peña Bernaldo de Quirós, 2001:227). See also Roldán (1985). Thanks to Benito Arruñada and Fernando Gomez for the pointer.

faith, the court can assign the occupied land to the builder and force her to pay damages to the landowner. Therefore it is open both to the builder to ask the judge to force the landowner to sell the land (Rule VII) and also to the landowner to ask the judge to force the builder to buy it (Rule VIII). As a Rule VII, the Italian law confers the decision over the allocation of the entitlement upon the builder, who is the more efficient chooser. Used as a Rule VIII instead, it achieves lower allocative outcomes as it rests on the decision of the landowner. The use of the Italian rule as a put-option can be understood in distributional terms since the Rule VIII confers all payoffs to the landowner.²⁰

Damages are set by the law at “*double the value of the area occupied as well as compensation for damages.*” The damage measure can be divided into two parts: the *doubled value* is the exercise price of the option and the *compensation for damages* is the lump-sum transfer that must be paid even if the builder eventually returns the land. The damage measure is very favorable to the landowner. A large compensation is not necessarily an inefficient idea: if the builder faces a Rule VII, she transfers to the landowner more wealth than optimal damages; however, she does so without affecting her allocative decision, since part of this wealth is transferred regardless of the decision. The Italian law, however, has both double damages that are transferred only if land is taken, and fixed damages that are transferred regardless. The lump sum transfer thus looks fine both from the allocative and distributive point of view but the *doubled market price* measure is arguably over-compensatory: it causes builders to exercise the option to buy too infrequently. The combination of a Rule I with a Rule VII and a Rule VIII constrains builders’ opportunism; however, to a large extent it encourages it in landowners.

Swiss law. *t₀) Rule I. If conditions [a) emanating building b) good faith c) appropriate time elapsed] are all met then t₁) if [d) negligible impairment] then Rule III, otherwise Rule II. Damages: adequate.*

²⁰ Under Italian law, the state also (and not only private citizens) can acquire property through the institution of inverted accession (see the Supreme Court of Cassation ruling n.1464 of 26-feb-1983 and n. 8597 of 29-aug-1998). It is technically distinct from expropriation (taking). It is worth noticing that in such circumstances there is no need for the state to prove the emanation of the accession from an adjoining property. Moreover, the state does not pay double damages as would be the case for a private party under art. 938. CC but the much lower compensation envisaged by the norms on takings. If our intuition (see later in the text at Section 4.1) that the requirement for emanation is a filter against opportunistic use of the law by the builder is true, somebody supporting the idea of a benevolent state may argue – correctly – that this requirement is not necessary when the “builder” happens to be the public authority. However, inverted accession has been often used as a shortcut in order to circumvent some safeguards for the landowner embedded in the norms on appropriations. Thanks to Maurizio Pontani for the pointer.

The landowner can eject the builder only if she acts in a timely manner (property Rule I). Otherwise, and presuming she acted in good faith, the builder can obtain an easement for negligible encroachments (property Rule III) and force the landowner to sell the property against adequate compensation for larger encroachments (liability Rule II). Damages are meant to be “adequate.”

The Swiss rule seems to privilege the allocative aspect of building encroachments. In fact when the loss is negligible for the landowner, the transfer is simply set via a property Rule III and when the encroachment is more substantial, the landowner cannot aspire to obtain anything more than adequate damages under a Rule II; a rule – as we have seen – which is among the best in allocative terms but not the most favorable to the landowner.

As such the rule is quite good at containing landowners’ opportunism (by excluding the applicability of Rule I after a short time and substituting it with Rule II and III) and imposing checks on builders’ opportunism by juxtaposing conditions (a) and (b).

Portuguese law. *t₀) Rule I. If conditions [(a) emanating building b) good faith c) 3 months elapsed] are all met then t₁) Rule VII. Damages: value of the land + depreciation – if existent – of the remaining land; T = repair for the resulting prejudice.*

The landowner can eject the builder within three months (Rule I). After that and under the presumption of good faith, the builder can force the landowner to sell the land (Rule VII). The formulation of the damage measure is particularly detailed and can be disentangled into the exercise price set at the value of the land and additional compensation for the depreciation – if existent – of the remaining land while damages that compensate for the resulting prejudice must be paid regardless of whether the builder eventually buys.

Again, conditions (a) and (b) seem to constrain the builder’s opportunism while condition (c) seems more targeted at controlling the landowner’s.

Norwegian law. *t₀) Rule I. If conditions [(a) emanating building b) good faith c) disproportionate costs from dismantling as opposed to keeping the structure] are all met then t₁) either Rule II or VI is applied. Damages: damage or nuisance incurred.*

The landowner is granted a property Rule I unless the removal or correction of the building entails expenses and losses that are disproportionate to the benefits gained and unless the builder operated in good faith. If both conditions apply, then both the builder and the landowner may force the transfer of the entitlement to the builder (by means of an easement) by asking the authority to apply a Rule II and/or a Rule VI respectively. Damages are set at the measure of compensatory damages; however, if the structure was originally placed unlawfully on the neighboring property then damages are set at gain-stripping

level in such a way as to make the builder give up all the gains from the encroaching building. The Norwegian law²¹ stands out from those of other jurisdictions for this explicit cost-benefit test that, if passed, triggers the switch between a property Rule I and one of the two liability rules.

As for other previous rules, the default use of Rule I as well as conditions (a) and (b) seem to target builders' opportunism. Condition (c) replaces the short time requirement seen in previously described rules and seems to be aimed at partially constraining landowners' opportunism. In fact, if the latter waits for v_B to grow than it is likely that the costs of demolishing the structure grow disproportionately against the merits of protecting the landowner's property. If this happens, then the builder may invoke a Rule II and in this case she can gain control of the land for no more than the damage amount.

German law. *t₀) Rule I. If conditions [a) emanating building b) builder in good faith c) no objection by landowner before or immediately after d) builder not grossly negligent] are all met then t₁) either Rule II or VI is applied. Damages for Rule II: compensatory damages; damages for Rule VI: land market value at the time of the encroachment.*

If the landowner files an objection before or immediately after the encroachment, she can obtain the ejection of the builder (Rule I). If she fails to object and under the presumption that the builder has acted in good faith and without gross negligence, the builder may retain the building by paying annual damages (Rule II). The landowner can force the sale of the occupied land and recover the value of the land at the time of the encroachment (Rule VI).

The German law, similarly to the Italian and Norwegian laws, envisages the use of both a put-option and a call-option: while the first one is preferable from an allocative point of view, the implementation of the second can be supported by distributional considerations. Note that while under the Rule II the builder must pay annual compensatory damages that can be waived by contract, under the Rule VI the landowner can force the purchase of the land to be recorded in the land registry. Although this difference might be minimal in economic terms (see footnote 6), its legal ratio shows how the law has strong distributional preferences for the landowner (conferring upon her a put-option) and imposes upon her the duty to tolerate the builder's encroachment only as long as it is strictly necessary (Rule II ceases when the encroachment ceases as well).

The conditions imposed by German law on parties' opportunism are particularly tough. On one hand, builders face conditions (a) and (b) as before, in addition to condition (d). This implies the need for the builder to show her mistake has been made not only in good faith (condition (b)) but also without

²¹ I am indebted to Endre Stavang for the pointer.

gross negligence. On the other hand, the landowner's incentive to wait is curbed by condition (c) which requires the objection to be made even before and in any case no later than "immediately after" the encroachment.

United States law. *t₀) Rule I. If some of the conditions [a) emanating building b) builder in good faith c) disproportionate costs from dismantling as opposed to keeping the structure d) builder not in gross negligence] are met then t₁) Rule II. Damages may be compensatory damages; land market value at the time of the encroachment.*

American case law on the issue is quite extensive and the variety of different ways in which building encroachments are addressed seem to imply that the argument cannot be considered settled law yet (see Merrill & Smith, 2007).

It can be safely said that the law prescribes that no person may erect structures so that any part encroaches upon adjoining land.²² When this happens the court of remedy has the discretionary power²³ to issue a mandatory injunction²⁴ to compel the removal of the encroachment (property Rule I) as an alternative to legal remedy (Rule II). Injunctive relief should be granted with caution and depends on the equities of both parties²⁵ and on the circumstances of the case.²⁶ In deciding whether to issue an injunction, the court should consider on one hand the avoidance of judicial approval of private eminent domain by the builder, and on the other hand it should prevent extortion by the landowner, who may use an injunction to "compromise" the claim.²⁷ Injunctive relief and restitutionary remedies²⁸ are normally issued where there is a plain and intentional violation of the plaintiff's rights²⁹ and against her manifest opposition³⁰ or when the defendant does not exercise due care in ascertaining boundaries.³¹

²² *McKee v. Fields*, 187 Or. 323, 210 P.2d 115 (1949).

²³ See *Heinrich v. Hinson*, 600 S.W.2d 636 (Mo. Ct. App. W.D. 1980).

²⁴ See *Triplett v. Beuckman*, 40 Ill. App. 3d 379, 352 N.E.2d 458 (5th Dist. 1976); *Blakeslee v. Punnett*, 48 A.D.2d 641, 368 N.Y.S.2d 216 (1st Dep't 1975) and *Andrews v. North Coast Development, Inc.*, 270 Or. 24, 526 P.2d 1009 (1974).

²⁵ See *Heinrich v. Hinson*, 600 S.W.2d 636 (Mo. Ct. App. W.D. 1980).

²⁶ *City of Eustis v. Firster*, 113 So. 2d 260 (Fla. Dist. Ct. App. 2d Dist. 1959)

²⁷ *Kratz v. Independent Order of Oddfellows, Garden City Lodge No. 11*, 442 Mich. 136, 500 N.W.2d 115 (1993).

²⁸ See the draft version of the American Law Institute's Restatement (Third) on Restitution and Unjust Enrichment Ch 5 § 40.

²⁹ *Wolf v. Miravalle*, 372 S.W.2d 28 (Mo. 1963).

³⁰ *Sokol v. Nickoli*, 347 Mich. 146, 79 N.W.2d 485 (1956) and *McLendon v. Johnston*, 243 Ark. 218, 419 S.W.2d 309 (1967).

³¹ *Malchow v. Tiarks*, 122 Ill. App. 2d 304, 258 N.E.2d 811 (3d Dist. 1970).

But if the defendant constructs with good faith or without warning that she is encroaching³² then the court should balance equities between the two parties.³³ In striking this balance, the court may consider: whether the burden to the defendant of removing the encroachment is disproportionate to the hardship of the plaintiff in allowing the encroachment to remain;³⁴ the size of the encroachment; the cost of removal; the benefit of removal for the landowner; whether any affirmative acquiescence on the part of the landowner may allow the builder to pursue estoppel against landowner's claims; and whether the builder is judgment-proof.³⁵

There are several measures of damages. Generally, a landowner is entitled to damages in an amount that will compensate for the encroachment³⁶ and not in excess of it.³⁷ If the builder is not required to remove the encroachment, which is thus permanent in nature, the measure of damages is the difference between the value of the property before and after the encroachment.³⁸ The value may be based on the property's reasonable rental value.³⁹ Moreover damages can be higher if the landowner was delayed in using land and/or forced to buy other land because of the encroachment.⁴⁰

4. DISSECTING BUILDING ENCROACHMENT LAWS

The laws we have just summarized are more articulated than the ones stylized and derived from the Ayresian framework. In particular basically all of them (except for the French one) are structured as follows: they present a default case for a property rule that allows the landowner to claim restitution of the land occupied by the building. Then, if some conditions are satisfied, one or more of the optional rules can be applied instead. Under some of these rules, the encroachment is remedied through the transfer of the control over the portion of land occupied by the building (and only over this portion). This transfer of control can take the form of a transfer of ownership (Italian, Swiss, German,

³² *McLendon v. Johnston*, 243 Ark. 218, 419 S.W.2d 309 (1967).

³³ *Carrier v. Lindquist*, 2001 UT 105, 37 P.3d 1112 (Utah 2001).

³⁴ *Kratze v. Independent Order of Oddfellows, Garden City Lodge No. 11*, 442 Mich. 136, 500 N.W.2d 115 (1993).

³⁵ *Malnar v. Whitfield*, 1985 OK 82, 708 P.2d 1093 (Okla. 1985).

³⁶ *Richard v. Mead*, 141 Cal. App. 2d 866, 297 P.2d 680 (2d Dist. 1956). Mich.--*Sokol v. Nickoli*, 356 Mich. 460, 97 N.W.2d 1 (1959). W.Va.--*Kincaid v. Morgan*, 188 W. Va. 452, 425 S.E.2d 128 (1992).

³⁷ *Jenss Bldg. Corp. v. Nikitas*, 20 A.D.2d 616, 244 N.Y.S.2d 875 (4th Dep't 1963).

³⁸ *Easter v. Dundalk Holding Co.*, 233 Md. 174, 195 A.2d 682 (1963). N.Y.--*Generalow v. Steinberger*, 131 A.D.2d 634, 517 N.Y.S.2d 22 (2d Dep't 1987).

³⁹ *Goodover v. Lindsey's Inc.*, 255 Mont. 430, 843 P.2d 765 (1992).

⁴⁰ *Ferrigno v. Odell*, 113 Conn. 420, 155 A. 639 (1931).

Portuguese), a lease (German) or an easement (Swiss, Norwegian, United States; see also footnote 5). In addition to the particular legal vesture of the transfer (full ownership, rent, easement) the national laws differ in the particular conditions they require to trigger the switch, for the rule or rules they allow to switch to and for the measure of damages adopted. We here disentangle these characteristics, which are also presented and schematized in Table 2.

4.1. CONDITIONS FOR TRIGGERING OPTIONAL RULES

Emanation: There is a difference if the building is wholly or only partly erected on the neighbor's land, thus on whether it emanates from a legitimate construction or it is a stand-alone unlawful structure built entirely on the other's land. In all codes analyzed, general provisions exist that address the case of structures entirely built on someone else's property and they all treat them as severely as the French law. However all legislations, except the French one, have specific provisions for the subset of encroachments that emanate from a construction on adjoining land.

The Norwegian rule stands apart: a liability rule still applies to stand-alone structures but damages are set at a gain-stripping measure instead of a compensatory one. Gain-stripping measures are more punitive for the builder and usually support property rule-type remedies. Therefore, although the rule is technically a liability rule, its goals more closely resemble those of property rules (Rizzolli, 2008).

Why is the special treatment of the encroachment granted conditional to the emanation requirement? It is arguable that the emanation condition reinforces the credibility of the non-opportunistic nature of the encroachment by the builder: while it is reasonable that a neighbor may slightly encroach by mistake, it is unlikely that a neighbor or even less a stranger would happen to build by mistake entirely on another's property. Absent this condition, the builder could try to build on another's land hazarding that the landowner would not notice it in time to seek ejectment. The condition of emanation thus limits the opportunism of the builder.

Intentionality: In order to obtain any favorable measure (something that is not ejectment), the builder must have acted with good faith. How is it possible to erect a structure by mistake? As noted before, this may occur due to incorrect surveys, or simply miscalculations by the builder and/or the landowner.⁴¹ Usually the burden of proving that the builder was not in good faith rests with the landowner. Good faith and opportunism are antithetic. The requirement of good faith prevents the builder from strategically anticipating

⁴¹ Note that the German and United States laws also add gross negligence to the factors limiting the applicability of the rule.

the granting of a liability rule and thus using encroachments as a mechanism to appropriate the landowner's property non-consensually. Good faith implies that the builder has acted not with the purpose of forcing the landowner to sell but only as a consequence of a mistake.

Time: Usually, the more time that elapses between the beginning of the construction and the objection of the landowner, the less likely the landowner is to obtain relief under the full property Rule I. After a relatively short amount of time (*three months* in the case of the Italian and Portuguese case, *immediately after* in the German one), the property rule switches to one of the liability rules. The rationale seems to be that, after a reasonable amount of time, the builder may have operated non-trivial and irreversible investments and therefore it would be socially wasteful to mandate her to undo the building altogether. Better to weigh these costs against the costs due to the landowner for giving up her entitlement and being compensated for the loss suffered. Absent this condition, a landowner may find it convenient to wait for the builder to accumulate specific investments and then seek to hold her up by threatening ejection. Conversely, the short time limit induces the landowner to come forward early if she wants to maintain the land or to wait and seek monetary compensation instead. Contrary to the previously described conditions, the short time condition serves the purposes of keeping in check the potential opportunistic behavior of the landowner.

Relevance and cost-benefit test. The more negligible the encroachment is for the landowner and the more burdensome the removal of the encroachment for the builder, the more likely it is that the encroachment will be remedied via a liability rule. This variable is explicitly considered in both the Swiss and United States rules. A more sophisticated variant that considers the costs of destroying the builder's investment against the gains of restoring the landowner's property is present in the Norwegian law. In both variants, the ratio seems pretty much straightforward: the more negligible the encroachment, the more the costs of undoing the investments must be weighed against it in terms of social welfare. However, there might be a slight difference concerning whose opportunistic behavior the two conditions are aimed at. The relevance condition seems to target the landowner willing to make a great deal out of a negligible encroachment, while the cost-benefit test seems to screen builders whose encroachments are less valuable than the impairment they caused and who nevertheless want to persist with the construction (maybe in the hope of forcing the landowner to bribe them out).

In general both relevance and net-benefit conditions are a substitute for the time condition. The time condition described above seems to urge the landowner to seek the enforcement of her rights before the investments of the

builder are too large. The relevance and net-benefit conditions do the same, only in a more direct way.

Table 1

	Condition: emanation	Condition: builder's good faith	Condition: short time notice of the landowner	Condition: relevance/cost-benefit	Damages as the option exercise price	Damages as lump sum transfer	Rules applied if conditions are not met	Rules applied if conditions are met
<i>French</i>	No	-	-	-	-		rule I	
<i>Italian</i>	Yes	yes	3 months	no	twice the market value	compensation for damages	rule I	rule VII, VIII
<i>Swiss</i>	Yes	yes	timely manner	yes	compensatory		rule I	rule II, III
<i>Portuguese</i>	Yes	yes	3 months	no	value of land	compensation for resulting prejudice	rule I	rule VII
<i>Norwegian</i>	Yes	yes	no	yes	compensatory/ gain-stripping		rule I	rule II, VI
<i>German</i>	Yes	yes	before or immediately after	no	compensatory/ market value		rule I	rule II, VI
<i>USA</i>	Yes	yes	yes	yes	market value		rule I	rule II

In this table we can recognize some patterns between the rules as well as the main differences.

4.2. MEASURES OF DAMAGES

Damages are computed in many ways. We must, however, distinguish between those damages transferred regardless of the final allocation of the entitlement from those that need to be paid only if the ownership eventually changes. As for the former type, this lump-sum transfer is envisaged by both the Italian and the Portuguese laws and it is computed for instance by looking at the damages suffered during the temporary impairment. As for the latter type, we have previously seen how optimal damages should be based on the non-chooser's mean valuation of the entitlement. This can be approximated by a standard compensatory measure of damages that is often found in the laws here analyzed (see in particular the Swiss and Portuguese laws). Other laws seem to favor a *market value* measure of damages: a measure that refers to a recurrent price of the land practiced by intermediaries. Both methods have their

arguments for and against. Determining exact compensation of idiosyncratic values is a daunting task for the authority, especially when they attempt to compensate idiosyncratic valuations that are often attached to long lasting ownership of land. On the other hand, a market value is difficult to assess in thin markets characterized by low homogeneity and substitutability of traded goods such as the land market. There are some peculiarities: the German law seems to apply a compensation measure of damages if the builder opts for the periodical payments but switches to a market value measure if she decides to redeem the land. The Italian rule instead sets the amount of damages equal to *double the value of the land occupied*; perhaps an excess of care towards the impairment suffered by the landowner.

4.3. USING OPTIONAL LAW TO PERFECT ALLOCATION AND DISTRIBUTION AND CONDITIONS TO FILTER OPPORTUNISM

Once all these conditions are put together we can see that these laws are crafted in such a way as to filter the cases for which building encroachment provisions are applicable. The law strives to keep two opportunistic behaviors by both the builder and the landowner at bay. As we have seen in section 2.1, by simply using the menu of rules of optional law the authority cannot contain both opportunisms. On one hand, a rule distributionally favoring the landowner induces her to wait for the builder to accumulate specific investments and then try to hold up the builder. On the other hand, a rule that favors the builder may induce her to venture into constructing on another's land anticipating a non-consensual acquisition of the property.

These laws solve this dilemma in another way and they all basically follow the same scheme: by default they attempt to defend the landowner's interests with a property Rule I and only if i) the landowner behaves negligently or opportunistically (she "forgets" to seek ejection in a timely manner and/or asks unreasonable compensation) and ii) the builder proves the encroachment is an unintentional mistake (she proves "emanation" and good faith) do they then switch to rules that allow for a non-consensual transfer of the land to the builder.⁴²

⁴² The case for deploying a property rule as the default remedy may be dictated also by other considerations: i) by using a property rule the court avoids making costly (as required for instance by the cost/benefit tests) valuations (see Kaplow & Shavell, 1996; Brooks, 2002) which they might not be inclined to do and ii) the division of the landowner's property as a consequence of the encroachment may cause some diseconomies of scale and scope if the use of the rest of the land is somehow compromised by the encroachment. Some laws (see the Portuguese for instance) try to account for the devaluation of the rest of the land in assessing damages.

After the switch we see deployed the whole menu of optional rules presented above. After the switch takes place, laws differ widely in the type of rules they implement and the way they assess damages. Most laws include Rules II (Swiss, German, Norwegian, United States), some the more vigorous variant of it that is Rule VII (Italian and Portuguese), some (German and Norwegian) have also a put-option style Rule VI, Italian law even embeds a stronger variant of the put-option rule (Rule VIII) and at least one (Swiss law) also has a property Rule III. Accepting our normative claim (the builder is the most efficient chooser), all national laws that embed in one way or another a Rule II produce the highest total payoffs. Rule II however is quite harmful to the landowner as it penalizes her in distributive terms. Rules VII and V would be equally efficient. As far as Rule VII is concerned, we have seen laws (such as the Italian and Portuguese) that envisage *lump-sum transfer* damages in addition to *exercise-of-option price* damages to be paid only if the builder finally acquires the land. The initial transfer transforms a Rule II into a Rule VII and biases the distribution towards the landowner without affecting the allocative decision of the builder. As for Rule V, we have not encountered any instances of this. In fact Rule V, although efficient, shoulders the distributional burden of the allocation totally onto the landowner. On equity grounds this seems unacceptable. Indeed Rule V confers upon the builder a put-option that is basically valid *erga omnes*. As such it resembles an *in-rem* right: the builder just needs to encroach on somebody's land and this authorizes her to force the unlucky landowner to sell. However, Epstein (1997, 1998), Ayres (1998) and Smith (2004) point out that "puts as a matter of law are never imposed on strangers" (Epstein, 1997) and "they can exist as a remedial choice only after a violation of a legal right is established." Indeed there exists a striking difference between cases where the put-option is in the hand of the landowner complaining at impairment by a builder's encroachment, and where it is in the hand of the builder who can then choose to deprive the landowner of her entitlement non-consensually. In the first case we are dealing with an *in-personam* relation between the encroacher and the encroachee, and the put-option is one of the remedies at the impaired landowner's disposal and can be exercised only against the builder; whereas in the second case the builder can exercise the put option against whomever she chooses to encroach upon and as such it resembles more closely an *in-rem* right. The absence of Rule V, however, is not the end of put-options. Rule VI, which mirrors Rule V with the put-option in the hands of the landowner, is found in both German and Norwegian law. Under our criterion this rule is less efficient than the three seen before, but it is at least distributionally acceptable as it concentrates the gains in the hands of the landowner. Italian law implements Rule VIII, a stronger variant of Rule VI. On distributive grounds, both Rule VI

and VIII are preferable to Rule II and this might explain why they surface as competing rules in the Italian, German and Norwegian systems. Rule III is only applied in the borderline cases of minimal encroachments although, as we will see shortly, Rule III lies somewhat in the background of all rules as it intervenes in case of adverse possession once the statutes of limitations expire.

4.4. BUILDING ENCROACHMENTS AND ADVERSE POSSESSION

Before moving to the conclusions it is necessary to clarify how cases of building encroachments stand against other fundamental cornerstones of property law: the doctrine of adverse possession and – its equivalent in civil law systems – the doctrine of *usucaption*. By virtue of adverse possession, most property laws allow long-standing, persistent encroachers to acquire title of land after some time has elapsed without the actual owner having actively sought to regain legitimate control of the property.⁴³ The law thus already provides a means – albeit a rough-and-ready one – of resolving conflicts arising from building encroachments: the landowner must prevail by means of a property Rule I until the statute of limitations under the doctrine of adverse possession shifts the entitlement to the builder and enforces it through a property Rule III. In between these two distant and opposite outcomes of the conflict, civil codes and common law provide more sophisticated tools for addressing building encroachments.

Inverted accession or other similar doctrines addressing building encroachments differ from adverse possession in many ways: first, building encroachments are applicable only to structures emanating from an adjoining plot of land, whereas adverse possession has much broader application. Second, the time length is considerably shorter (a few months as against several years). Third, good faith and other conditions must be fulfilled in order for building encroachment doctrines to apply, whereas under adverse possession good faith at most triggers shorter statutes of limitations.⁴⁴ Fourth, while

⁴³ The doctrine of adverse possession is a common core principle in most property laws (Mattei, 2000): after a number of years of actual, open and notorious, exclusive, continuous and hostile possession (Miceli & Simans, 1995) the law assigns the title of land to the trespasser. Adverse possession is not a simple statute of limitations that isolates the encroachment from action by the legitimate owner but it is also a transfer of title from the owner to the encroacher (see Miceli & Simans, 1995; Stake, 2001). The point in time at which the transfer takes place varies considerably among national laws: the term is 5 years in California, 12 years in England and Wales, 20 years in many countries including Italy and much of the US, 30 years in Louisiana, France and Germany (Netter et al., 1986).

⁴⁴ There are diverging views on what role the good faith requirement plays in adverse possession. While most scholars reject the idea that the applicability of adverse possession should depend on the trespasser's intent (however, see Merrill (1985) advocating a good-faith standard and Fennell (2006) for an argument in favor of a bad-faith requirement), most judges in American courts have consistently made their decision about granting adverse possession dependent on the

adverse possession is an abrupt switch from a Rule I to a Rule III, building encroachments make wider use of liability rules. Above all, the scopes of the two doctrines diverge: while adverse possession is a tool that – *inter alia* – clears title and triggers the productive use of land (Miceli & Sirmans, 1995; Baker et al., 2001), remedies to building encroachments are measures aimed at addressing good faith encroachments without destroying valuable investments and without inducing opportunistic behavior by either party.

5. CONCLUSIONS

Building encroachments represent a peculiar niche of property law. If ownership is fully enforced, then the building must be taken down; but if the building is left standing, then the encroachment is not addressed and property rights are undermined. In this context both parties may behave opportunistically: the builder may *try to build* in the hope of obtaining a non-consensual transfer of property; and the landowner may be tempted to *wait* and see the builder accumulating specific investments in the hope of holding her up later on. This tension has stimulated authorities to come up with a range of legal remedies that explore almost the entire spectrum of Ayresian optional rules.

All laws considered have in common a filtering mechanism that tries to screen and prevent the opportunistic use of encroachments by either party to the conflict. These filters are based on various combinations of the following requirements: i) good faith (the builder must be unaware of the fact that she is building on another's land); ii) the condition that ejection is granted if the landowner seeks it timely (the builder must stop building if the landowner requests this within a stipulated period from the beginning of construction); iii) the condition that the investment is not negligible or that the builder's investment is not inferior in value to the landowner's impairment; and iv) the condition that the building emanates from the builder's land. If these conditions are not met, then the encroachment is always addressed simply with a property Rule I that fully restores the landowner's rights. If they are, then different national statutes take different routes. Why do we see this degree of variety? Our answer is that the variety stems from the tension between the allocative and the distributional concerns of the authority. On allocative grounds, holding true to the normative criterion that builders generally have more speculative valuations of the land, we prefer rules where the builder chooses the final allocation of the land. On equity

trespasser's state of mind (Helmholz, 1983). By the same token most adverse possession provisions in civil codes recognize that, in case of good faith possession, the time requirement is reduced at a rate that varies among legal systems between one-third (Germany and France) and one-half (Italy).

grounds, however, the inclination of lawmakers is to let the landowner be fully compensated; the landowner, after all, has been the passive subject of the encroachment. In allocative terms Rules II, V and VII are more efficient than Rules IV, VI and VIII. Least efficient are the two property rules. However, on distributional grounds, a Rule VIII is preferable to a Rule VI, which is in turn preferable to a Rule I, and so on (see Figure 2). On distributional grounds we can thus justify the implementation of put-option rules in some of the rules we have seen; quite an oddity in property law.

Efficient allocation or just distribution? This seems to be the irreconcilable puzzle that lies at the bottom of these different rules. This does not have to be necessarily the case, however. To begin with, note that Rule II, which is embedded in some of the rules analyzed here, ranks top in the allocative ranking and fairly low in the distributional ranking. This suggests that, after all, Rule II has been understood correctly as being efficient but also quite unfair. Fairer than this – so German, Norwegian and Italian legislators may have hypothetically thought – there could be Rule VI and VIII that squeeze distribution further in favor of the landowner but – as we have seen – leave the allocative decision resting in the hands of the less efficient chooser. Interestingly, there is a rule that is as favorable to the landowner as Rule VI without being less efficient than Rule II: it is Rule VII, which envisages a transfer from the builder to the owner that is paid regardless of the builder's final decision over the allocation of the land. We find traces of this rule in the Portuguese and Italian statutes (this latter one, however, fails to be efficient in the way it determines damages).

The normative contribution of the paper can thus be synthesized with the Ayresian suggestion of implementing Rule VII more widely whenever we have a party at fault (thus needing to be penalized distributionally) that is nevertheless the most efficient chooser.

On the positive side, the modest accomplishments of the present paper are twofold: it casts light on this area of the law – contiguous to adverse possession although far less explored by scholars – and it spots some put-option rules in the context of property law, the very existence of which has been questioned by leading property scholars.

Appendix 1: Derivation of First Normative Criterion

The present appendix follows closely the derivation of the convexity result in Ayres & Goldbart (2001).

Because of the put-call parity properties of options⁴⁵ the equation of the total payoffs for rules with the builder as the chooser (Rules II/V) can be also rewritten as

$$(1) \quad E(\pi_{\text{builder-chooser}}) = \mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B = \mu_B + \int_{\mu_B}^{\infty} (v_B - \mu_B) f_B(v_B) dv_B$$

Note that μ_L is the exercise price, $\int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$ is the value of the call-option, μ_B is the average builder's valuation of the entitlement and $\int_{\mu_B}^{\infty} (v_B - \mu_B) f_B(v_B) dv_B$ is the value of the put-option.

By the same token, the equation of total payoffs for rules for which the landowner is the chooser can be rewritten as:

$$(2) \quad E(\pi_{\text{landowner-chooser}}) = \mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L = \mu_L + \int_{\mu_L}^{\infty} (v_L - \mu_L) f_L(v_L) dv_L$$

We have now two equations that describe the relative efficiency in terms of total expected payoffs of the two sets of rules: the builder-as-the-chooser one and the landowner-as-the-chooser one.

⁴⁵ Put-call parity defines a relationship between the price of a call option and a put option – both having the same underlier, strike price and expiration date (Stoll, 1969). The rule can be generally stated as *call + exercise price = put + underlying asset*. See also Knoll & Center (2002).

$$\left\{ \begin{array}{l} (a) \mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B > \mu_L + \int_{\mu_L}^{\infty} (v_L - \mu_L) f_L \\ (b) \mu_L + \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B > \mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L \\ (c) \mu_B + \int_{\mu_B}^{\infty} (v_B - \mu_B) f_B > \mu_B + \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L \\ (d) \mu_B + \int_{\mu_B}^{\infty} (v_B - \mu_B) f_B > \mu_L + \int_{\mu_L}^{\infty} (v_L - \mu_L) f \end{array} \right. = \left\{ \begin{array}{l} \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B > \int_{\mu_L}^{\infty} (v_L - \mu_L) f \\ \mu_L - \mu_B < \int_{\mu_L}^{\infty} (v_B - \mu_L) f_B - \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L \\ \int_{\mu_B}^{\infty} (v_B - \mu_B) f_B > \int_{\mu_B}^{\infty} (v_L - \mu_B) f_L \\ \mu_B - \mu_L > \int_{\mu_B}^{\infty} (v_B - \mu_B) f_B - \int_{\mu_L}^{\infty} (v_L - \mu_L) f \end{array} \right.$$

Listed above are the four equivalent conditions for which (1) is greater than (2); that is to say, Rules II, V and VII produce larger aggregate payoffs than Rules IV, VI and VIII. Conditions (a) and (c) suggest that the relative efficiency of the rules crucially depends upon the variance of the distribution of $f(v_B)$ and $f(v_L)$; that is to say, the more speculative is the valuation of the builder relative to that of the landowner, the more likely it is that the rules that give the option to the builder will produce higher aggregate payoffs.

Conditions (b) and (d) suggest that neither the mean valuation nor the difference in mean is relevant to determining which type of rule is more efficient. To see why, note that (b) – where the landowner has a higher mean – seems to imply the likelihood that she is the more efficient chooser while (d) seems to hold the opposite. Since these are equivalent conditions both cannot be true. As it turns out, neither intuition is true because the values of the options at the other end of the inequality also change in ways that offset the direct impact of the change in litigants.⁴⁶ To see how, note that if the mean valuation of the builder increases relative to that of the landowner, then – other things being equal – the value of both the put-option in the hand of the builder and the call in the hand of the landowner must increase as well. If instead the mean valuation of the landowner is to overtake the builder’s, then the call-option in the hand of the landowner gains further in monetary value and the put-option of the builder decreases. Therefore if on the left hand side of (b), μ_L increases vis-à-vis μ_B , so does the call-option $\int_{\mu_B}^{\infty} (v_L - \mu_B) f_L(v_L) dv_L$ in respect to $\int_{\mu_L}^{\infty} (v_B - \mu_L) f_B(v_B) dv_B$.

To conclude: the fundamental findings of the Ayres & Goldbart (2001) characterization of the optional law are twofold: first, seemingly opposite rules

⁴⁶ More than this: the two inequalities are actually equivalent. The rigorous demonstration that is beyond the scope of the present article is available in the appendix of Ayres & Goldbart (2001).

containing put and call (like Rules II and V) lead to identical solutions in terms of aggregate allocative efficiency and vary only in the matter of distribution among the parties;⁴⁷ and second, the variance of parties' valuations of the entitlement is the most important factor in assessing which rule is likely to achieve higher levels of aggregate payoffs.

Appendix 2: National Laws Relevant to Building Encroachments

A2.1. FRENCH LAW: *Code Civil*

Article 545: Nul ne peut être contraint de céder sa propriété, si ce n'est pour cause d'utilité publique, et moyennant une juste et préalable indemnité. 1

Article 555 (Loi no 60-464 du 17 mai 1960): Lorsque les plantations, constructions et ouvrages ont été faits par un tiers et avec des matériaux appartenant à ce dernier, le propriétaire du fonds a le droit, sous réserve des dispositions de l'alinéa 4, soit d'en conserver la propriété, soit d'obliger le tiers à les enlever. Si le propriétaire du fonds exige la suppression des constructions, plantations et ouvrages, elle est exécutée aux frais du tiers, sans aucune indemnité pour lui; le tiers peut, en outre, être condamné à des dommages-intérêts pour le préjudice éventuellement subi par le propriétaire du fonds. Si le propriétaire du fonds préfère conserver la propriété des constructions, plantations et ouvrages, il doit, à son choix rembourser au tiers, soit une somme égale à celle dont le fonds a augmenté de valeur, soit le coût des matériaux et le prix de la main-d'oeuvre estimés à la date du remboursement, compte tenu de l'état dans lequel se trouvent lesdites constructions, plantations et ouvrages. Si les plantations, constructions et ouvrages ont été faits par un tiers évincé qui n'aurait pas été condamné, en raison de sa bonne foi, à la restitution des fruits, le propriétaire ne pourra exiger la suppression desdits ouvrages, constructions et plantations, mais il aura le choix de rembourser au tiers l'une ou l'autre des sommes visées à l'alinéa précédent.

A2.2. SPANISH LAW: *Codice civil derecho civil de cosas*

Artículo 362. El que edifica, planta o siembra de mala fe en terreno ajeno, pierde lo edificado, plantado o sembrado, sin derecho a indemnización.

Artículo 363. El dueño del terreno en que se haya edificado, plantado o sembrado con mala fe puede exigir la demolición de la obra o que se arranque la plantación y siembra, reponiendo las cosas a su estado primitivo o a costa del que edificó, plantó o sembró.

Artículo 364. Cuando haya habido mala fe, no sólo por parte del que edifica, siembra o planta en terreno ajeno, sino también por parte del dueño de éste, los derechos de uno y otro serán los mismos que tendrían si hubieran procedido ambos de buena fe. Se

⁴⁷ The decoupling of efficiency concerns from allocative concerns is the most impressive achievement among the accomplishments of optional law (Ben-Shahar, 2006).

entiende haber mala fe por parte del dueño siempre que el hecho se hubiere ejecutado a su vista, ciencia y paciencia, sin oponerse.

Artículo 365. Si los materiales, plantas o semillas pertenecen a un tercero que no ha procedido de mala fe, el dueño del terreno deberá responder de su valor subsidiariamente y en el solo caso de que el que los empleó no tenga bienes con que pagar. No tendrá lugar esta disposición si el propietario usa del derecho que le concede el artículo 363.

A2.3. ITALIAN LAW: *Codice Civile, Libro III, Della Proprietà*

Art. 938 Occupazione di porzione di fondo attiguo: Se nella costruzione di un edificio si occupa in buona fede una porzione del fondo attiguo, e il proprietario di questo non fa opposizione entro tre mesi dal giorno in cui ebbe inizio la costruzione, l'autorità giudiziaria, tenuto conto delle circostanze, può attribuire al costruttore la proprietà dell'edificio e del suolo occupato. Il costruttore è tenuto a pagare al proprietario del suolo il doppio del valore della superficie occupata, oltre il risarcimento dei danni.

A2.4. SWISS LAW: *Code Civil Suisse*

Art. 674 Constructions empiétant sur le fonds d'autrui: (1) Les constructions et autres ouvrages qui empiètent sur le fonds voisin restent partie intégrante de l'autre fonds, lorsque le propriétaire de celui-ci est au bénéfice d'un droit réel. (2) Ces empiètements peuvent être inscrits comme servitudes au registre foncier. (3) Lorsque le propriétaire lésé, après avoir eu connaissance de l'empiètement, ne s'y est pas opposé en temps utile, l'auteur des constructions et autres ouvrages peut demander, s'il est de bonne foi et si les circonstances le permettent, que l'empiètement à titre de droit réel ou la surface usurpée lui soient attribués contre paiement d'une indemnité équitable.

A2.5. PORTUGUESE LAW: *Portuguese Civil Code*

Artigo 1343. Prolongamento de edificio por terreno alheio: (1) Quando na construção de um edificio em terreno próprio se ocupe, de boa fé, uma parcela de terreno alheio, o construtor pode adquirir a propriedade do terreno ocupado, se tiverem decorrido três meses a contar do início da ocupação, sem oposição do proprietário, pagando o valor do terreno e reparando o prejuízo causado, designadamente o resultante da depreciação eventual do terreno restante. (2) É aplicável o disposto no número anterior relativamente a qualquer direito real de terceiro sobre o terreno ocupado.

A2.6. NORWEGIAN LAW: *Norwegian Act No. 15 of 16th June 1961 § 11*

§ 11. Hus eller anna byggverk som ulovleg står såleis at noko av det er inne på granneeigedom, har grannen krav på vert bortteke eller retta opp. I tilfelle då dette kom til å valda så store utlegg eller tap elles at det klårt stod i mishøve til gagnet, og det ikkje er noko nemnande å leggja eigaren av byggverket til last, kan det gjerast unnatak frå rettingsskyldnaden mot at grannen får vederlag som ikkje må setjast mindre enn skaden eller ulempa.

Var byggverket frå fyrst av sett ulovleg inn på granneeigedom, må vederlaget for rett til å ha det ståande til vanleg ikkje setjast mindre enn vinninga av innpåbygginga.

Vert byggverket retta oppatt eller flytt eller går det til grunne, fell retten over granneeigedom bort.

A2.7. GERMAN LAW: *Bürgerliches Gesetzbuch. BGB German Civil Code 2002*

§ 912 *Überbau; Duldungspflicht*: (1) Hat der Eigentümer eines Grundstücks bei der Errichtung eines Gebäudes über die Grenze gebaut, ohne dass ihm Vorsatz oder grobe Fahrlässigkeit zur Last fällt, so hat der Nachbar den Überbau zu dulden, es sei denn, dass er vor oder sofort nach der Grenzüberschreitung Widerspruch erhoben hat. (2) Der Nachbar ist durch eine Geldrente zu entschädigen. Für die Höhe der Rente ist die Zeit der Grenzüberschreitung maßgebend.

§ 913 *Zahlung der Überbaurente*: (1) Die Rente für den Überbau ist dem jeweiligen Eigentümer des Nachbargrundstücks von dem jeweiligen Eigentümer des anderen Grundstücks zu entrichten. (2) Die Rente ist jährlich im Voraus zu entrichten.

§ 914 *Rang, Eintragung und Erlöschen der Rente*: (1) Das Recht auf die Rente geht allen Rechten an dem belasteten Grundstück, auch den älteren, vor. Es erlischt mit der Beseitigung des Überbaus. (2) Das Recht wird nicht in das Grundbuch eingetragen. Zum Verzicht auf das Recht sowie zur Feststellung der Höhe der Rente durch Vertrag ist die Eintragung erforderlich. (3) Im Übrigen finden die Vorschriften Anwendung, die für eine zugunsten des jeweiligen Eigentümers eines Grundstücks bestehende Reallast gelten.

§ 915 *Abkauf*: (1) Der Rentenberechtigte kann jederzeit verlangen, dass der Rentenpflichtige ihm gegen Übertragung des Eigentums an dem überbauten Teil des Grundstücks den Wert ersetzt, den dieser Teil zur Zeit der Grenzüberschreitung gehabt hat. Macht er von dieser Befugnis Gebrauch, so bestimmen sich die Rechte und Verpflichtungen beider Teile nach den Vorschriften über den Kauf. (2) Für die Zeit bis zur Übertragung des Eigentums ist die Rente fortzuentrichten.

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